CLAIMS

We Claim:

1.   A system having a redundant topology for communication between one or more devices and a central hub comprising:

a central hub having a plurality of ports;

a first end node having a first port and a second port;

a first active cable connected to the first port in the end node and a first port of the plurality of ports in the hub; and,

a second active cable connected to the second port in the end node and a second port of the plurality of ports in the hub, wherein the first active cable and the second active cable transmit a same first packet of data to the first end node.

2.   The system of claim 1 further comprising:

a second end node having a first port and a second port;

a third active cable connected to the first port in the second end node and a third port in the hub; and,

a fourth active cable connected to the second port in the second end node and a fourth port in the hub, wherein the third active cable and the fourth active cable transmit a same second packet of data to the second end node.

3.   The system of claim 1 further comprising:

a plurality of additional end nodes, each end node having a first port and a second port, and,

a plurality of additional active cables, each active cable connecting one of the first port and the second port of one of the plurality of additional end nodes to a corresponding port of the plurality of ports in the hub.

4.   The system of claim 1 wherein the first end node is configured to perform an integrity check to a packet of data received on the first active cable and is configured to perform an integrity check on a packet of data received on the second active cable.

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5.   The system of claim 4 wherein the integrity check to a packet of data received on the first active cable is a CRC check, and wherein the integrity check to a packet of data received on the second active cable is a CRC check.

6.   The system of claim 1 wherein the first active cable is provided a first route from the first end node to the hub, and the second active cable is provided a second route from the first end node to the hub, and wherein the first route is different than the second route.

7.   The system of claim 3 wherein each active cable connecting a specific one of the plurality of end nodes to the hub is provided with a different route from the specific one of the plurality of end nodes to the hub.

8.   The system of claim 1 wherein the hub is connected to an Internet.

9.   The system of claim 1 wherein the hub is connected to an Intranet.

10.   The system of claim 3 wherein the hub is connected to an Internet.

11.   The system of claim 3 wherein the hub is connected to an Intranet.

12.   The system of claim 3 wherein the first end node and the plurality of end nodes are configured in a star configuration with each end node having two cable connections to the hub.

13.   The system of claim 3 wherein in one of the first end node and the plurality of end nodes is a programmable logic controller.

14.   The system of claim 3 wherein in one of the first end node and the plurality of end nodes is an IO device.

15.   The system of claim 3 wherein in one of the first end node and the plurality of end nodes is a bridge.

16. The system of claim 3 wherein in one of the first end node and the plurality of end nodes is a gateway.

17. The system of claim 3 wherein in one of the first end node and the plurality of end nodes is a relay.

18. The system of claim 3 wherein in one of the first end node and the plurality of end nodes is a motor starter.

19. The system of claim 1 wherein the end node utilizes one of the packet of data received from the first active cable and the packet of data received from the second active cable that is first determined by the end node to be valid.

20. The system of claim 4 wherein the end node only performs an integrity check on a second one of the packet received from the first active cable and the packet received by the second active cable if an integrity check on a first one of the packet received from the first active cable and the packet received of the second active cable fails.

21. An end node for use in a system having a redundant topology comprising:
a device having a first upstream connection port for upstream connection via an active first cable to one of a another device and a hub, a second upstream connection port for upstream connection via a second active cable to the one of a another device and a hub, a first downstream connection port for downstream connection via a third active cable to another device, and a second downstream connection port for downstream connection via a fourth active cable to another device.

22. The end node of claim 21 further comprising:
a third upstream connection port for upstream for upstream connection via a fifth active cable to one of a another device and a hub.

23. The end node of claim 21 further comprising:
a third downstream connection port for downstream connection via a sixth active cable to a another device.

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24. The end node of claim 21 further comprising:

a plurality of additional upstream connection ports, each of the plurality of additional upstream connections ports for upstream connection via a corresponding first plurality of additional active cables to one of a another device and a hub.

25. The end node of claim 24 further comprising:

a plurality of additional downstream connection ports, each of the plurality of downstream connection ports for downstream connection via a corresponding second plurality of additional active cables to another device.

26 The end node of claim 21 wherein each of the ports is an Ethernet port.

27. The end node of claim 21 wherein the device is a programmable logic controller.

28. The end node of claim 21 wherein the device is a bridge.

29. The end node of claim 21 wherein the device is a gateway.

30. The end node of claim 21 wherein the device is a relay.

31. The end node of claim 21 wherein the device is a motor starter.

32. The end node of claim 21 wherein the device is an IO module.

33. A system having a redundant daisy chained configuration comprising:

a central hub; and,

a first chain of end nodes including a first end node having a first upstream port, a second upstream port, a first downstream port and a second downstream port, a first active cable connecting the first port of the first end node to the hub, a second active cable connecting the second upstream port to the hub, a third active cable connecting the first downstream port to a first upstream port of a second end node in the first chain, and a fourth active cable connecting the second downstream port to a second upstream port of the second end node.

34. The system of claim 33 wherein each end node in the first chain utilizes a first valid message received by the end node over any of the active cables connected to the end node.

35. The system of claim 33 wherein the second node of the first chain includes a first downstream port and a second downstream port.

36. The system of claim 35 further comprising a fifth active cable connecting the first downstream port of the second node to a first upstream port of a third end node in the first chain, and a sixth active cable connecting the second downstream port of the second end node in the first chain to a second upstream port in the third end node in the first chain.

37. The system of claim 33 further comprising a second chain of end nodes, the second chain of end nodes including a first end node having a first upstream port, a second upstream port, a first downstream port and a second downstream port, a first active cable connecting the first port of the first end node to the hub, a second active cable connecting the second upstream port to the hub, a third active cable connecting the first downstream port to a first upstream port of a second end node in the second chain, and a fourth active cable connecting the second downstream port to a second upstream port of the second end node.

38. The system of claim 37 further comprising a fifth active cable connecting the first downstream port of the second node in the second chain to a first upstream port of a third end node in the second chain, and a sixth active cable connecting the second downstream port of the second end node in the second chain to a second upstream port in the third end node in the second chain.

39. The system of claim 33 further comprising a plurality of chains of end nodes connected to the hub, wherein each of said plurality of chains include a first end node having a first upstream port, a second upstream port, a first downstream port and a second downstream port, a first active cable connecting the first port of the first end node to the hub, a second active cable connecting the second upstream port to the hub, a third active cable connecting the first downstream port to a first upstream port of a second end node in each chain, and a fourth active

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cable connecting the second downstream port to a second upstream port of the second end node in each chain.

40.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is a programmable logic controller.

41.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is an IO module.

42.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is a bridge.

43.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is a gateway.

44.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is a motor starter.

45.   The system of claim 39 wherein at least one of the end nodes in the plurality of chains of end nodes is a relay.

46.   An end node for use in a redundant network system comprising
a device having a first port for connecting to the system to receive a first message over a first active cable, and a second port for connecting to the system to receive the first message over a second active cable wherein the device is configured to utilize one of the first message received over the first active cable and the first message received over the second active cable that first passes an integrity check performed by the device.

47.   The end node of claim 46 wherein the first port is an Ethernet port and the second port is an Ethernet port.

48.   The end node of claim 46 wherein the device can transmit a second message over the first active cable through the first port, and transmit the second message over the second active cable through the second port.

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49.   The end node of claim 46 wherein the device is a programmable logic controller.

50.   The end node of claim 46 wherein the device is an IO module.

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~~52.~~   The end node of claim 46 wherein the device is a bridge.

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~~53.~~   The end node of claim 46 wherein the device is a gateway.

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~~54.~~   The end node of claim 46 wherein the device is a motor starter.

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~~55.~~   The end node of claim 46 wherein the device is a relay.